United States
Environmental Protection
Agency




Site Characterization and Monitoring Technical Support Center

FY09 Report
October 2008 – September 2009

Office of Research and Development
Office of Science Policy www.epa.gov/ord/osp
Superfund and Technology Liaisons

Site Characterization and Monitoring Technical Support Center

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Office of Science Policy
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BACKGROUND

On October 1, 2007, the Site Characterization and Monitoring Technical Support Center (SCMTSC) changed operation from the NERL Laboratory in Las Vegas to the Superfund and Technology Liaison (STL) Program of ORD's Office of Science Policy (OSP). Information on the program and a list of the STLs is located at http://www.epa.gov/OSP/hstl.htm.

Felicia Barnett, the STL in Region 4, is the SCMTSC Director with support from Bill Hagel, the STL in Region 3, and Kathleen Graham, the STL in Region 8. The SCMTSC Director receives requests for technical support from individual STLs on behalf of their regional waste program staff. Each STL works with his or her regional staff to determine if and how ORD can best handle their technical support needs.

Each ORD Technical Support Center provides support on a different focus area. The SCMTSC provides support on sampling and monitoring-related issues.

Technical Focus of the SCMTSC

- Provide geostatistics statistical design, analysis, and expertise
- Conduct field sampling and/or monitoring and contaminant measurement activities, including:
  - — Soil-Gas measurements
  - — Site characterization technologies (e.g., field portable X-ray fluorescence)
  - — Fingerprinting of wastes
  - — Geophysics
- Evaluate reports, models, and work plans related to field sampling and measurement approaches
- Develop issue papers and provide state-of-the-science information
- Provide reliable and accurate information on innovative site characterization and remediation technologies
- Perform special analytical services
- Provide GIS and data interpretation

FY09 TECHNICAL SUPPORT OCTOBER 1, 2008 – SEPTEMBER 30, 2009

The following is a listing of all projects and requests the SCMTSC handled during FY09.

GENERAL SUPPORT

Scout – Online Modeling Software

Scout software provides a wide variety of classical and robust statistical methods not typically available in other commercial software packages. A major part of Scout deals with classical, robust, and resistant univariate and multivariate outlier identification, and robust estimation methods that have been available in the statistical literature for the last three decades.

Work was completed on the Scout Users' Guide and the Scout Factsheet. Several minor bugs in the Scout software were corrected and delivered to the EPA Technical Representative for evaluation.

PROUCL 4.00.02 UPGRADES AND TECHNICAL ASSISTANCE

The ProUCL software package was developed to support risk assessment and clean-up decisions at contaminated sites based upon full data sets with or without non-detect (ND) observations.

Upgrades for the ProUCL software were completed on March 6, 2009, and the software executable files were delivered to the EPA Technical Representative in Las Vegas. Upgrades included configuring the software to process data sets consisting of NDs and an unequal number of values in the x and D_x columns. Sections added to the ProUCL Technical Guide and Users' Guide address minimum sample size issues regarding the number of detected and non-detected values in a data set. ProUCL can be downloaded at http://www.epa.gov/nerlesd1/tsc/TSC_form.htm.

ProUCL technical assistance requests in FY09 continued. With the release of ProUCL version 4.00.02, additional questions about the changes resulted in three months of increased activity. The SCMTSC provided more than 120 people with ProUCL assistance. Support included providing assistance for installing the software, installation of .NET software, help with error messages, importing data, use of data spreadsheets, and constructing data matrices. Technical guidance was provided in the areas of statistical options within the software (Wilcoxon Mann-Whitney test, and "robustified" 95% upper tolerance limits [UTLs]), use of minimum detection differences, the number of samples and number of NDs required for valid statistical analyses, incorporating sample NDs into the statistical analysis, identification of outliers, and identification of multiple sample populations. Evaluations of two user data sets were conducted and advice was provided on the type of upper confidence limits (UCLs) that the ProUCL software recommends.

SHORT-TERM IMPLEMENTATION REQUESTS

The SCMTSC addresses numerous short-term requests weekly. Examples of SCMTSC short-term requests include:

- Lockheed provided comments to Region 10 on the use of the appropriate statistical method for background regarding the FMC site in Pocatello, Idaho.
- Lockheed provided comments to Region 10 on a suggested approach for dealing with the variability of the Multi-Increment Sampling (MIS) effort in the South Park Neighborhood of Seattle to address possible polychlorinated biphenyl (PCB) contamination.
- Stephen Billets of the Las Vegas Lab provided support to Region 5 concerning the use of dioxin immunokits and immunoassays.
- Wayne Sovocool of the Las Vegas Lab provided comments on the potential for polycyclic aromatic hydrocarbons (PAHs) to be created from a hydrocarbon resin process at a Saturn Chemical Site in Region 2.
- Don Betowski of the Las Vegas Lab responded to Region 9/Navajo Nation issues concerning analytical methods for toxaphene detection specifically for sampling at old sheep dip vat sites.
- Ron Williams of the RTP Lab provided comments to Region 9 on the sampling strategy for air deposition from the Halaco site.
- Lockheed responded to Region 1 questions about statistical analysis using composite samples and the Wilcoxon Rank Sum test on groundwater natural attenuation data.
- Lockheed provided specific support to Region 7 on the use of "robustified" 95% UTLs for background samples.

REGION/PROGRAM-SPECIFIC SUPPORT

In FY09, the SCMTSC provided support for 20 sites in eight regions –1, 2, 3, 4, 7, 8, 9, and 10 (see Chart 1), performing 41 separate tasks, including site-specific work, requested training/presentation meetings, and work for the program office (see Chart 2).

CHART 1
FY09 Technical Support by Number of Sites per Region

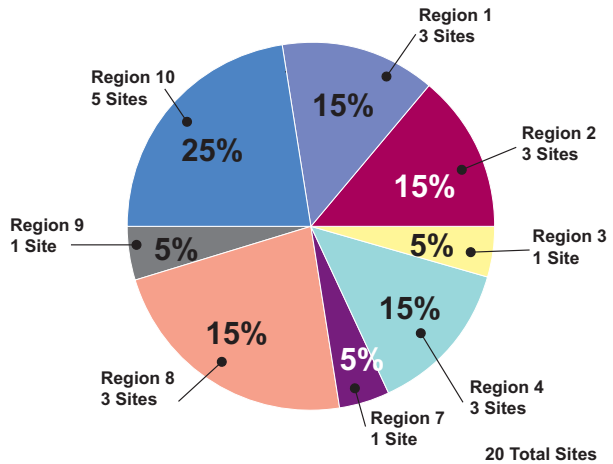
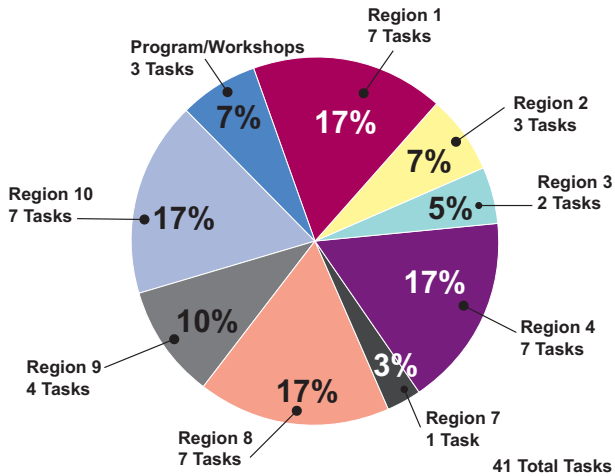


CHART 2
FY09 Technical Support by Number of Tasks per Region



SITE-SPECIFIC SUPPORT BY REGION

BRUNSWICK NAVAL AIR STATION SITE – Region 1

The Brunswick Naval Air Station site occupies 3,094 acres in the Town of Brunswick, Maine. It is located south of the Androscoggin River, between Brunswick and Bath, south of Route 1, between Routes 24 and 123. Among the site areas, three were used primarily as landfills for the Naval Air Station's household, office, and other wastes. The landfills were used from 1945–1979. Other areas reportedly had releases occur or were used for disposal of various acids, caustics, solvents, and building materials, including asbestos, or were used for fire training purposes. Approximately 3,000 people live on the base within 1 mile of the site areas. An elementary school, college, and hospital are located within 1 mile of the western base boundary. Area surface water is used for recreation, irrigation, and commercial fishing.

Task 1 – Conducted an evaluation of the statistical methods proposed in the Background Study Sample and Analysis Plan for the Brunswick Naval Air Station site. The evaluation report for the Brunswick Naval Air Station site was delivered to the Remedial Project Manager (RPM) on February 16, 2009. The following statistical recommendations were provided:

1. For data sets with non-detects (NDs), rigorous statistical methods are better suited for left-censored data sets consisting of non-detects (NDs) and below detection limit observations. Several methods for data sets consisting of non-detects (NDs) are available in the ProUCL 4.00.02 software provided by EPA.
2. For more defensible and reliable conclusions (e.g., controlling decision errors), it is suggested that appropriate multivariate methods be used on multivariate data sets to perform site versus background comparisons. Scout 2008 software provided by the EPA is available for this purpose.

Task 2 – Responded to external comments on the EPA-generated evaluation report for the Background Study Sample and Analysis Plan for the Brunswick Naval Air Station site. The response to the external comments was delivered to the RPM on May 8, 2009. Recommendations to use ProUCL software were provided and concurrence was provided regarding the use of multivariate statistical methods.

MASSACHUSETTS MILITARY RESERVATION SITE

MASSACHUSETTS MILITARY RESERVATION SITE – Region 1

The Otis Air National Guard Base/Camp Edwards site, more commonly known as the Massachusetts Military Reservation (MMR), covers approximately 22,000 acres. Although the occupants and property boundaries have changed several times since MMR was established in 1935, its primary mission has always been to provide training and housing to Air Force and/or Army units. A review of past and present operations and waste disposal practices identified numerous potentially contaminated areas, including several areas located on the southern portion of MMR. These contaminated areas are the result of historic chemical/fuel spills, fire training activities, landfills, and drainage structures. Additionally, effluent from the former sewage treatment plant historically was discharged into sand beds, where it seeped into the groundwater. In 1984, the U.S. Geological Survey detected contaminants in monitoring wells downgradient of this former plant. In 1983 and 1984, the Air Force detected volatile organic compounds (VOCs) in onsite monitoring wells near the Base Landfill and a Fire Training Area. Monitoring also detected VOCs in several hundred private wells (all of which have been replaced by municipally-supplied water) and in one town well (which was shut down). The EPA designated the Sagamore Lens underlying MMR as a sole source aquifer under the Safe Drinking Water Act.

Through the Idaho National Laboratory (INL), the SCMTSC is working with the Region I MMR Project Team to develop site-specific Soil Screening Levels (SSLs). The purpose is to identify contaminants of concern (COCs) in soils, which if mobilized to groundwater, would result in exceeding a Maximum Contaminant Level (MCL) or other risk-based standard. The U.S. Army has consistently maintained that while useful for identifying compounds in soils with the potential of having an unacceptable impact on groundwater, the MMR SSLs overestimate the mass of contaminant present in soil and over predict the migration of dissolved contaminants through the unsaturated zone.

Activities include further development and refinement of Maximum Allowable Soil Concentrations (MASCs) and oversight of sorption and desorption experiments. Batch and column experiment results help to develop site-specific loading rates and partitioning coefficients (Kd) for predicting transport of propellants, explosives, and pyrotechnic (PEP) compounds from surface soils through the vadose zone. The data gathered from these experiments, which were presented in an approved work plan, will and have been used to fill site-specific data gaps in assessing the behavior of these compounds in soils at MMR. Task work included background document reviews, participation on conference calls, and attendance at a meeting in Boston.

Task 1 – Calculated MASCs for the groundwater pathway for research department explosive; hexahydro-1,3,5,-trinitro- 1,3,5-triazine (RDX), high-melting explosive; octahydro-1,3,5,7-tetranitro-1,3,5,7 tetrazocine (HMX), Tungsten, and 2,4,6-trinotrotoluene (TNT).

ONONDAGA LAKE

Task 2 – Document reviews of reports selected by RPM.

Task 3 – Review of report titled "Sorption/Desorption Measurements of Nitroglycerin and Dinitrotoulene in Camp Edwards, Massachusetts Soil." Draft comments submitted to RPM in September 2009.

FORT DEVENS SITE – Region 1

The Fort Devens site, located northwest of Boston, is comprised of approximately 9,280 acres divided into North, Main, and South Posts. Three principal drinking water wells are located within one mile of the Shepley's Hill Landfill (on the Main Post)—the McPherson water supply well (located west of the wetlands near Nonacoicus Brook) and the Devens and Grove Pond Wellfields (located on the south shore of Grove Pond and upgradient of the landfill).

Task 1 – Region 1 requested noninvasive methods of identifying bedrock fractures. It was hypothesized that naturally occurring radioactive radon gas preferentially follows the bedrock fractures and when characterized at the surface, correlation could be established between surface and subsurface fracture zones.

The SCMTSC used the INL's Backpack BaSIS to support an ongoing bedrock mapping project at an approximately 100-acre granitic bedrock upland area adjacent to the Shepley's Hill Landfill. A survey of this area was completed, consisting of detailed maps indicating areas of elevated radiation, and contour plots of radiation intensity. The report titled "Surface Radiation Survey at the Shepley's Hill Remediation Site, Devens, Massachusetts" was received by RPM Bill Brandon in May 2009. The report was finalized in September 2009 after two rounds of comments.

Task 2 – INL presented the following results and recommendations to Region 1 managers:

- BaSIS surveys appear to depict surface rock outcrop locations.
- Elevated concentrations of radon cannot be ruled out to be present in the soils above the subsurface fractures due to length of count time using Sodium Iodide (3 X 5-inch) detectors.
- Detectors exist (CR-29) that correlate Rn-222 soil concentrations to locations of subsurface fractures but take nearly 10 days to complete measurement.
- Atmospheric conditions affect gamma-ray spectrometers (i.e., BaSIS).
- CR-29s directly measure Rn-222 alpha decay particles.
- Unlike gamma-ray spectrometers (BaSIS), CR-39 particle track detectors are not hindered by short-term fluctuations in barometric pressure and soil moisture content.
- As such, it is proposed that a more detailed study of the Rn-222 concentration in soils at Shepley's Hill be conducted using CR-39 particle track detectors. This may be a more effective means for locating subsurface fractures using a minimally invasive, proven technique.

ONONDAGA LAKE SITE – Region 2

The Onondaga Lake site includes the lake, seven major and other minor tributaries, and upland sources of contamination to the lake (subsites). Onondaga Lake has an areal extent of about 4.5 square miles, with a drainage basin of approximately 285 square miles. Effluent from the Metropolitan Syracuse Sewage Treatment Plant discharges into the southeastern end of the lake. Onondaga Lake flows to the northwest into the Seneca River. Historically,

industrial processing plants and municipal wastewater treatment plants routinely discharged their wastes into the lake. The availability of salt and limestone led to the location of the Solvay Process Company, the predecessor to AlliedSignal, Inc. (Honeywell International, Inc. is a successor corporation of the AlliedSignal, Inc.), on the west shore of the lake for the production of soda ash.

Today, vast areas on the western shoreline are occupied by the "Solvay waste beds," which contain by-products of the company's soda ash production. In 1946, AlliedSignal initiated a mercury cell process that produced chlorine, sodium hydroxide, and potassium hydroxide at its facility on Willis Avenue, and later expanded to include a facility on Bridge Street. Waste streams containing mercury and other heavy metals were discharged by these facilities. Honeywell's Semet Residue Ponds, which contain volatile organic compounds (VOCs) from facilities associated with the production of benzene, toluene, naphthalene, xylene, and "motor benzol," are an additional source of contamination to the lake. Other industrial and manufacturing facilities are also located along the shore or tributaries to the lake and may be sources of contamination. Onondaga Lake adjoins parklands owned by Onondaga County. Public fishing was banned from the lake in 1970, but it was opened to allow catch-and-release fishing in 1986.

Surface water is contaminated with mercury. Sediments are contaminated with PCBs; pesticides; creosotes; heavy metals, including lead, cobalt, and mercury; PAHs; and VOCs. The groundwater at many of the upland sub-sites is also contaminated. Several species of fish native to the lake have high concentrations of mercury. Contact with or ingestion of contaminated groundwater, surface water, or sediments could pose a health threat.

Based on the comments returned, the SCMTSC finalized the statistical evaluation of Appendices A, B, and C of the interim Human Health Risk Assessment (HHRA) submitted to the RPM in September 2008, and closed out the task in November 2008.

CORNELL-DUBILIER ELECTRONICS SITE – Region 2

The Cornell-Dubilier Electronics site is located at 333 Hamilton Boulevard in South Plainfield, New Jersey. During its years of operation at the site (1936–1962), Cornell-Dubilier Electronics, Inc. manufactured electronic parts and components, including capacitors. Transformer oils reportedly were tested for an unknown amount of time during plant operations. During its operations, Cornell-Dubilier Electronics, Inc. allegedly dumped material contaminated with PCBs and other hazardous substances directly onto site soils. The site is currently known as Hamilton Industrial Park and is occupied by an estimated 15 commercial businesses. Through the years, numerous companies have operated at the site as tenants. It is estimated that approximately 540 people reside within 0.25 miles of the site, and the nearest residential homes are less than 200 feet from the site. The total population estimated to live within 1 mile of the site is 8,700. An unnamed tributary to the Bound Brook traverses the southeast corner of the site property. Water bodies that join the unnamed tributary are designated by the State of New Jersey for the maintenance, migration, and propagation of the natural and established biota. An investigation that the New Jersey Department of Environmental Protection (NJDEP) conducted in the vicinity of Hamilton Boulevard prior to 1991 revealed significant groundwater contamination consisting mainly of the VOCs trichloroethylene and tetrachloroethylene. Due to widespread contamination, residential wells in the area were closed and residents were hooked up to a municipal water supply.

Based on comments on the September 2008 report to the RPM, the SCMTSC finalized the report on an evaluation of data sets to determine if there has been a statistically significant increase in the mean concentrations of PCBs over time and closed out the task in November 2009.

SYNCON RESINS SITE – Region 2

Syncon Resins once manufactured paints, varnishes, and resins on a 5-acre site in South Kearny, Hudson County, New Jersey. The company closed in 1981 and declared bankruptcy. The site is situated within a coastal wetlands management area and is bordered on the west by the Passaic River, a tidal waterway. About 11,000 55-gallon drums are stored in warehouses and in the open on the ground. Analysis indicates that many drums contain hazardous substances. Many are volatile and flammable, posing air pollution and fire threats. Some drums have rusted, spilling their contents onto the soil. Several bulk storage tanks suspected of containing hazardous substances are also located on the site. Two unlined ponds used for subsurface disposal of process waste contain hazardous organics. A large amount of soil is contaminated, and groundwater is contaminated with organic chemicals, including benzene, PCBs, and toluene.

The RPM received a statistical evaluation of the background and site data collected from the Syncon Resins Superfund Site on August 3, 2009. The evaluation provided background versus contaminated site comparisons using two-sample hypotheses testing methods, and Background Threshold Values (BTVs)/trigger values that can be used to estimate site-specific Preliminary Remediation Goals (PRGs) and cleanup criteria.

FORMER NANSEMOND ORDNANCE DEPOT SITE – Region 3

The Former Nansemond Ordnance Depot (FNOD) site is located in Suffolk, Virginia, near the northwestern end of State Route 135. The U.S. Department of Army obtained the property between 1917 and 1929 and it was known as Pig Point Ordnance Depot. During World War I, the facility was used for munitions storage, shipment, classification, and destruction, handling up to 1,300 tons of ammunition daily. In 1929, the facility's name changed to Nansemond Ordnance Depot. During World War II, the facility supported operations at the Hampton Roads Port of Embarkation, including storage and shipment of all types of ammunition overseas. It also received captured enemy munitions for processing and further shipment to other U.S. military facilities. Toward the end of the war, it was used as a distribution depot, performing ammunition reconditioning and loading. In April 1945, the Depot was in demobilization, including the destruction of unserviceable explosives, ammunition, and chemicals. GE acquired part of the property in 1965, including an existing military building that the company modified in 1966, doubling its size. GE used this modified building as a television assembly plant. In the early 1970s, GE added a finished goods warehouse onto the building. GE eventually acquired a total of about 134 acres of the former Nansemond Ordnance Depot. GE operated a television assembly plant at this location until approximately 1988.

In spring 1987, it was discovered that bulk explosives, munitions, shells, and other ordnance items, both spent and unexploded, had been disposed of by the DoD in a 2- to 3-acre area adjacent to College Drive on Tidewater Community College (TCC) property. The U.S. Army Corps of Engineers (USACE) conducted a confirmation study of this area (the TCC Removal Area) in June and July 1987 under the Defense Environmental Restoration Program. The study showed the presence of ordnance and ordnance-related materials, including 19 live munitions, numerous grenades, and a slab of crystalline TNT estimated to weigh several tons. From November 1988–February

MUNITIONS FOUND AT NANSEMOND ORDNANCE DEPOT SITE

1989, the following materials were removed from the Removal Area: 4,400 pounds of boosters, 260 pounds of bulk explosives, 1,360 pounds of munitions/miscellaneous ordnance, and 30,275 pounds of contaminated soil. USACE conducted additional fieldwork in the Removal Area from November 1989–February 1991 as part of a Remedial Investigation and Feasibility Study (RI/FS). Chemicals of concern identified in the RI/FS included heavy metals and 2-amino-4,6-dinitro-toluene (2-A-4,6-DNT) in surface soils, and heavy metals, TNT, 2,4-dinitrotoluene (DNT), trinitrobenzene (TNB), dinitrobenzene (DNB), 2-A-4,6-DNT, N-methyl-N,2,4,6-tetranitro-aniline (tetryl), and hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) in groundwater. From April–June 1992, 316 tons of contaminated soil and miscellaneous ordnance items, including two 3–foot British shells, were removed from the Removal Area. Confirmatory soil samples indicated the presence of residual soil contamination.

An evaluation of the Multi-Increment Sampling (MIS) approach of the site was completed and a report titled "Statistical Evaluation of Multi-Increment Soil Sampling (MIS) Approach and its Applicability in Addressing Various Project Objectives of Environmental Investigations" was delivered to the RPM on January 20, 2009. MIS is recommended as a cost-saving approach to sampling and analysis at the site.

Task 1 – Conducted an extensive evaluation of the MIS approach to determine if it is adequate for assessing the Region 3 Nansemond Site. Conducted statistical evaluations of actual and simulated site data for different

MUNITIONS (LEFT) AND CANNONBALL (RIGHT) FOUND AT NANSEMOND ORDNANCE DEPOT SITE

MIS situations to determine the efficacy of the MIS approach and provided results of the evaluations. A simulation computer program was developed and field scenarios were generated.

Summary conclusions regarding the evaluation include:

- The proposed MIS approach differs from the approaches described in the literature. The proposed approach does not keep track of spatial information important for making defensible decisions to address environmental project objectives. SCMTSC's opinion is that without spatial information (coordinates of locations), it is not possible to use variography as described in the literature, which is used to address short- and long-range variability present within a Decision Unit (DU). Knowledge about the range parameters is useful for determining optimal spacing between the successive increments (e.g., distance between parallel paths) for collecting MIS increments.
- Data Quality Objectives (DQOs) for the MIS approach need to be developed and documented. DQOs developed for the discrete sampling approach may not be applicable to decision rules based upon MIS data and statistics. Based upon MIS data and MIS mean, it is not possible to develop defensible decision rules, and decision errors associated with such decision rules (e.g., based upon comparison of MIS mean to an SSL) remain unknown and unquantifiable.
- A single MIS statistic, such as the 95% upper confidence limit (UCL95), will lead to a single conclusion about the entire DU, including the entire DU is clean/safe (e.g., when UCL95 < = SSL) or the entire DU is not clean (e.g., when UCL95 > SSL). Decision errors associated with such a decision rule need to be evaluated and quantified. Based upon these kinds of statistics and decision rules, an incorrect clean-up decision could be made.
- A data set does not have to follow a normal distribution (or should be free of ND) to compute statistics of interest, including UCL95 and other upper limits to estimate background level concentrations. For data sets with and without ND observations, several rigorous nonparametric (not requiring normality) and computer intensive bootstrap methods are available in the literature. Many of those methods were incorporated in ProUCL 4.0 and Scout 2008 software packages to address various project objectives of an environmental evaluation.
- There is no substitute for graphical displays of environmental data sets as they provide added insight into a data set that cannot be revealed using simple statistics, such as simple mean, MIS mean, UCL95, *t*-test, etc. Whenever possible, and provided enough usable data are available, it is desirable to supplement statistical tests and results with meaningful graphical displays of data sets. These informative graphical displays cannot be generated using MIS data.

Task 2 – Final evaluation of the proposed MIS approach (now called Incremental Sampling Methodology [ISM]) to address site characterization, exposure, and risk assessment objectives. The interim final version of the document summarizing the evaluation results was delivered on July 20, 2009. The report summarized evaluations of actual and

simulated site data to determine the efficacy of the ISM approach. External comments to the July 20 document were received and responses to the comments were delivered on August 24, 2009.

With agreement from Region 3, information from this simulation is being provided to the ITRC MIS Team through volunteer work by the statistician.

BARITE HILL SITE – Region 4

The 795-acre Barite Hill/Nevada Goldfields site is located approximately three miles south of McCormick, in McCormick County, South Carolina. The site was actively mined for gold from 1991–1995. Operations included the use of a cyanide solution in a leaching process to extract gold from ore. Nevada Goldfields used seven processing ponds and one sediment pond, as well as a 10-acre acid pit, which contained approximately 60 million gallons of water with an average pH of 2.0 to 2.2 and a high dissolved metal content. Nevada Goldfields pursued site reclamation activities from 1995 until filing for bankruptcy in 1999. The property was then relinquished to the South Carolina Department of Health and Environmental Control.

The Barite Hill site is currently undergoing a removal action that includes the installation of an evaporative cap over a 250,000 cubic yard waste rock dump that extends into an adjacent 10-acre acid mine drainage-filled pit lake. The pit lake is undergoing lime neutralization and carbon loading. The cap is divided into northern and southern sections of similar design. The southern section covers the majority of the acid producing waste rock dump. The western upper 1/3 area of both caps is essentially flat and incorporates an HDPE liner. The eastern lower 2/3 area of each cap is graded to a 4:1 slope and is an evaporative cap constructed of 2 feet of locally derived compacted saprolitic silt covered by a 1-foot vegetated topsoil layer. The entire cap sheds run off into the pit lake. The combination of the pit neutralization and the capping of the waste rock dump are intended to maintain the pit lake at an acceptable pH and metals load over the long term.

The requested support for this site was an Integrated Cap Monitoring and Pit Monitoring Design for the mine pit lake and evaporative waste rock dump cap. The design needed to incorporate the level of monitoring required to evaluate the effectiveness of the cap's role in preventing the re-acidification of the pit lake over time.

BARITE HILL SITE

Coordinated through a Cooperative Agreement with INL, a monitoring plan was developed for an integrated autonomous low-cost system that included:

- A geophysical, hydrological self-calibrating general chemical sensor network backed by a secure integrated Web-based data storage and retrieval software system.
- Remote control and access to accessible as well as remote inaccessible monitoring systems.
- Automation of data collection, QA review, and reporting.
- Remote control of data acquisition systems.
- Secure Web-based data accessibility.
- Complementary multi-sensor monitoring networks.
- Critical event alarm capabilities.

Project Objectives:

Task 1 – Brief narrative report describing the TSC-INL design.

Task 2 – Draft and final Monitoring Design Report.

Task 3 – Site visit to witness early implementation of monitoring design.

Task 1 was completed in September 2008. Task 2 was completed in October 2008 and Task 3 was completed on November 21, 2008. Additional implementation work was later funded under a separate IAG between Region 4 and INL.

B.F. GOODRICH SITE – Region 4

The B.F. Goodrich (BFG) site is a 2-acre industrial landfill, located approximately two miles northeast of Calvert City, Kentucky, on the southern bank of the Tennessee River. BFG disposed of wastes on the site from 1969–1972 and engineered a former creek channel for landfilling.

An active Resource Conservation and Recovery Act (RCRA) component, a former landfill, and a burn pit area are now being addressed under Superfund. The potentially responsible parties (PRPs) are proposing soil flushing, but Region 4 requested SCMTSC assistance with the dense non-aqueous phase liquid (DNAPL) assessment so they could make a more informed decision about the site. Northwind is providing the support via the STREAMS contract.

Task 1 – Review of the Sampling and Analysis Plan for the DNAPL investigation. Sampling was conducted in spring 2009. The contractor also attended a site meeting.

Task 2 – The majority of the FY09 technical support provided assisted EPA in the transition of much of the site from RCRA to CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act). This transition included the incorporation of over 200 solid waste management units (disposal areas) and a 53-well groundwater collection and treatment system. This resulted in an expansion of the site area from 50 to 200 acres. Several documents were reviewed to address the transition issues and site visits and telephone meetings were required. The technical support assisted EPA in the assimilation of information for the new site areas and in the development of a General Management Approach (GMA) for the site. The GMA addresses the migration of contaminants to the Tennessee River, the characterization of the site, source removal actions, management of spills, and changes in plant infrastructure.

OLIN OP UNIT 2 SITE – Region 4

The Olin Corporation McIntosh Plant site is located approximately 1 mile east-southeast of the Town of McIntosh in Washington County, Alabama. The Olin main plant and associated properties cover approximately 1,500 acres. From 1952–1982, Olin produced chlorinated organic pesticides, chlorine, caustic soda, and sodium hypochlorite at the site. Presently, Olin produces chlorine, caustic soda, and sodium hypochlorite; and blends and stores hydrazide compounds at the site.

Work at OP Unit 2 (OU-2) is ongoing. In 2006, Olin constructed a berm, or raised barrier, with a gate around OU-2 as part of a study to test whether sediments that drop out of trapped floodwater from the Tombigbee River would form an effective natural cover over contaminated sediments in the OU-2 area. EPA reviewed the most recent data from this study and drew several preliminary conclusions; namely, floodwaters entering the site contain low amounts of sediment; those sediments are difficult to capture in the site; and the sediments will not form an effective cover. Olin collected additional data in summer 2009 and is participating in a capping study that EPA is conducting. Olin was scheduled to submit an OU-2 RI/FS report in fall 2009.

Region 4 requested help from both the SCMTSC and the Engineering Technical Support Center to address site characterization and remediation issues related to mercury-contaminated soils and sediments at the site. The support needed to have demonstrated experience on mercury-contaminated sites with specific consideration given to sediment sites. This knowledge would be essential in reviewing the PRPs' documents. Knowledge and expertise in modeling an estimated release of mercury flux through different capping materials was also needed.

Task 1 – Delineation of contaminant mass and concentration profile.

Based on historic and recent sampling results, the SCMTSC STREAMS contractor developed and reviewed the mass and concentration profiles for the Basin, Round Pond, and floodplain areas. The delineation was conducted for key COCs (mercury, methyl mercury, hexachlorobenzene, and DDTr) in various phases (i.e., the consolidated sediment, unconsolidated [fluff] layers and the surface water).

Task 2 – Technical support on conducting physical and chemical characterization of sediment, groundwater, and surface water and necessary sampling protocol.

The SCMTSC provided technical support, including evaluations, recommendations on all site-specific methods for collection, processing, suitability of devices/instruments, and analyses of water and sediment samples with emphasis on mercury and methyl mercury. The sampling methodologies were reviewed to ensure that the design/procedure was scientifically robust and defensible. Field oversight was provided for sampling performed in September 2009.

NATIONAL BEEF LEATHERS COMPANY SITE – Region 7

Activities at the National Beef Leathers site were an emergency response investigation to address public concerns about a St. Joseph, Missouri, leather tannery's distribution of waste sludge for use as agricultural fertilizer on northwest Missouri farms, and whether the sludge material contained hexavalent chromium. Due to the large area to be investigated, the SCMTSC developed statistically-based sampling approaches to characterize potential contamination in selected farmlands fertilized with the site sludge. The report of recommendations for the sampling plan was delivered to the Region on June 25, 2009.

CAPTAIN JACK MINE SITE – Region 8

The Captain Jack Mine site is located at the headwaters of upper Left Hand Creek about 1.5 miles south of Ward in Boulder County, Colorado. The site is in a narrow valley known as California Gulch. Mining for gold and silver in the region began in 1860 and ended in 1992.

The site is comprised of the Big 5 Mine (the upper mine), the Captain Jack, Ltd. Mill, the Black Jack Mine (the lower portal), and other mines and waste features in the immediate surrounding area. The Big 5 Mine, located about 500 feet upstream from the mill, consists of an adit (tunnel), a large tailings pile, and a settling pond. The mill works area includes several lagoons previously used for settlings tailings from the mill. The lower portal includes the Black Jack adit and the contents of a shed. Other mine wastes include waste material in Left Hand Creek and waste rock from the mine tunnels. In the 1890s there was a mining community known as Camp Frances.

The State of Colorado and EPA Region 8 issued a Record of Decision (ROD) for the site in September 2008. A major element of the site is the Big Five mine adit and underground mine-workings, which release 20-50 gpm of acid-mine drainage through the portal onto the mine-waste dump. The adit-tunnel extends westerly for 7,000+ feet, and intersects a connecting tunnel (the Niwot Crosscut) connecting the Big Five complex with the Columbia-mine district to the north near Ward. The intersection of these tunnels is believed to be 400–500 feet below ground surface. The geology is a vein-structure in granitic bedrock with erratic joints and fractures. Collapsed zones within the tunnel make it cost-prohibitive to make direct observations of geologic conditions and groundwater flows further into the tunnel.

The SCMTSC through INL provided technical services to cover several functions:

Design and QA Plans:

- Design geophysical work plan to determine the location of the Big Five–Niwot tunnel intersection.
- Oversee implementation of geophysical work plan to accurately pinpoint the Big Five–Niwot tunnel intersection.
- Conduct a field review, develop draft conceptual design for monitoring of mine-pool treatment and for external seepage monitoring of the mine-pool reservoir.

A student intern from the University of Arizona (graduate major in Geophysics) was retained to assist in all aspects of the project.

Task 1 – Reviewed data and systems related to the Captain Jack Mine project and began project planning for upcoming fieldwork.

Task 2 – Engaged in planning with EPA and the State of Colorado to locate the intersection/tunnel believed to be 400-500 feet below ground surface.

Task 3 – Designed geophysical work plan to determine the location of the Big Five–Niwot tunnel intersection. Draft work plan was submitted; final work plan is expected to be completed in early FY10.

Additional tasks based on the work plan will be performed in FY10.

REMOTE MINE MONITORING SYSTEM (TENMILE CREEK AND RIMINI/LUTRELL) – Region 8

The Upper Tenmile Creek Mining Area site is located in the Rimini Mining District, southwest of Helena, Montana, and consists of numerous abandoned and inactive hard rock mine sites that produced gold, lead, zinc, and copper. Mining began in the Rimini Mining District before 1870 and continued through the 1920s. Little mining has been performed in the district since the early 1930s.

Design, build, field install, and evaluate a prototype autonomous monitoring system that can provide near real-time information on environmental conditions and aqueous chemistry at remote, inaccessible mine sites. This EPA Pilot Study is sponsored by the Office of Research and Development.

New work plan from INL was submitted to David Reisman in September 2009 for approval.

STANDARD MINE

STANDARD MINE SITE – Region 8

Standard Mine, a National Priorities List (NPL) site, is located near Crested Butte, Colorado. Contaminants of concern are primarily heavy metals, including elevated levels of manganese, lead, zinc, cadmium, and copper. The Standard Mine releases 70 gallons/minute of groundwater from the abandoned mine workings to Elk Creek, and the Crested Butte municipal drinking water source downstream is potentially threatened. The SCMTSC through INL is providing technical services to cover several functions.

Task 1 – Oversee geophysical investigation(s) to determine the location of the groundwater flow patterns within the underground mine workings.

Task 2 – Oversee geophysical investigation(s) to determine if the Standard Mine fault, along which the workings were completed, is the main conduit for water within the mine system, or whether there are other faults controlling water movement.

Task 3 – Develop work plan for monitoring water levels within the mine workings once the bulkhead has been installed and monitor fluid movement near the fault in the area of the upper workings where a ground water cutoff trench is anticipated.

Tasks 1 and 2 are partially completed and expected to be done in early FY10.

SANTA SUSANNA FIELD LABORATORY SITE – Region 9

Santa Susana Field Laboratory (SSFL) is a 2,850-acre site located in Ventura County, California, approximately 2 miles south of the City of Simi Valley. The site is divided into four areas that are under different ownership. Boeing owns Areas I, III, and IV. The National Aeronautics and Space Administration (NASA) owns Area II and 42 acres of Area I. Since 1948, the principal activities in Areas I, II, and III of the SSFL have been large rocket engine research, assembly, and testing by Rocketdyne and NASA. From 1956–1988, Rocketdyne and the Department of Energy (DOE) used the Energy Technology and Engineering Center (ETEC) located in Area IV for nuclear energy research and development.

These site operations resulted in soil and groundwater contamination. Primary chemical contaminants include trichloroethylene (TCE), perchloroethylene (PCE), metals, and petroleum hydrocarbons. DOE, Boeing, and NASA are conducting clean-up actions of chemical contamination under the direction and oversight of the State of California Department of Toxic Substances Control (DTSC). DTSC is using RCRA as its regulatory authority. The extent of chemical contamination has not been fully characterized, but it is estimated that more than 500,000 gallons of TCE lies beneath the site.

Radionuclides associated with ETEC nuclear operations include tritium, plutonium-238, plutonium-239, iodine-131, strontium-90, cesium-137, cobalt-60, thorium-228, and uranium-235. Pursuant to the Atomic Energy Act, DOE has conducted decommission and demolition of ETEC buildings. DOE is currently preparing an Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA). The community is active and very involved.

Task 1 – Evaluation of the sampling requirements for the SSFL site was initiated in March 2009. Statistical methods for evaluating environmental data were recommended to ensure proper characterization of the site, which has radiological and chemical contamination. Several site documents were reviewed to identify and provide information on various statistical methods that could be used for evaluating environmental data at the site.

Task 2 – Provide technical and information support to the site team, which includes community members. A meeting was held with Nicole Motoux and Gregg Dempsey (EPA Region 9) on April 3, 2009 to discuss statistical methods

that can be used to evaluate environmental data to ensure proper characterization of the site. A conference call was held on April 29, 2009 and a stakeholder meeting was attended on April 30, 2009. Potential sampling approaches were provided at the stakeholder meeting. A report summarizing the proposed statistical methods to address statistical issues of the Radiological Background Study (RBS) evaluations to be performed at the SSFL site was delivered to the Region on June 5, 2009. A conference call was held on June 22, 2009 to discuss the calculation and evaluation of contaminant background threshold values

Task 3 – Develop a draft report summarizing the proposed statistical methods to address stakeholders' concerns and statistical issues described in the Sampling and Analysis Plan. The draft report was delivered to the Region on July 15, 2009 and the final report was submitted on July 31, 2009.

Task 4 – Develop a report summarizing statistical methods that can be used on gamma radiation count data to screen regions of Area IV exhibiting gamma radiation levels exceeding the background levels/investigation levels. The report was submitted to the Region on August 27, 2009.

JACKSON PARK SITE – Region 10

The Jackson Park Housing Complex (JPHC) site is located east of Highway 3, approximately 2 miles northwest of Bremerton, Washington. The 300-acre complex currently contains housing for 3,000 military personnel. From 1904–1959, the facility operated as a Navy ammunition depot and included ordnance, manufacturing, processing, and disassembly. Residual ordnance powders were disposed of by open burning. Hazardous dust deposited onto floors during ordnance handling was washed into floor drains that lead into Ostrich Bay. In addition to ammunition-related activities, the site also contained incinerators, paint, battery and machine shops, and a boiler plant. The munitions buildings were demolished between 1973 and 1975, when the housing complexes were built.

The SCMTSC provided information to the EPA Regional Representative Harry Craig on the potential use of indicator kriging for the Jackson Park site.

EASTERN MICHAUD FLATS SUPERFUND SITE – Region 10

The Eastern Michaud Flats Superfund Site (*aka* Simplot or FMC), located northwest of Pocatello, Idaho, covers approximately 2,530 acres. Two adjacent phosphate ore processing facilities, the FMC Corporation and the J.R. Simplot Company Don Plant, make up the Superfund site. These processing facilities operated from the early 1940s until the FMC facility closed in December 2001. The Simplot Don Plant facility is still in active operation.

Guidance was provided for computing an appropriate background statistic based on a site-specific background data set and comparing the result with a pre-established maximum concentration level (MCL) value. The guidance provided:

The background module of ProUCL software can be used to:

- Compare site concentrations data distribution to background concentrations data distribution;
- Compare point-by-point site data to some pre-established screening level such as BTV or not-to-exceed value; or
- Compute background Upper Threshold Value (UTV) based on site-specific background data.

When comparing site data to background data, a determination can be made whether the site concentrations can be considered as coming from site concentrations comparable to those of background. The main objective of performing background versus site concentrations comparison is to determine if site concentration data exceed upper background threshold levels (e.g., upper prediction limit [UPL], upper tolerance limit [UTL]) with high confidence. Background upper threshold typically is estimated by a 95% upper prediction limit (95UPL), 95% upper limit for 90th, or 95th percentile (95UTL90, or 95UTL95) provided enough background data are available. Thus, a 95% UPL or UTL is computed based upon background data, and individual point-by-point site observations are compared with those upper BTVs.

BUNKER HILL MMC SITE – Region 10

The long history of mineral extraction in the Coeur d'Alene Basin has left a legacy of heavy metal-laden mine tailings that have accumulated along the Coeur d'Alene River and its tributaries. The metals have contaminated the water and sediments of Lake Coeur d'Alene, and continue to be transported downstream via the Spokane River. In 1983, the EPA listed the Bunker Hill Mining and Metallurgical Complex on the NPL.

The SCMTSC through INL provided sequential extractions and leaching experiments on metals samples from the site.

The Coeur d'Alene Basin Commission and Region 10 asked the SCMTSC to conduct a series of extraction procedures and leach tests on soil from the area of the Central Impoundment Area (CIA) and in the Osborn Flats area. Exposed minerals from historic mining activities have contributed to contamination in the South Fork Coeur d'Alene River and its tributaries. Due to the challenge of cleanup, a preliminary study of metal availability and release from sediments from the area was performed to help understand the factors affecting metal mobility. Three groups of experiments were conducted:

Task 1 – Sequential extraction tests to determine the operational speciation of the metals in the sediment (including a Quality Assurance Project Plan [QAPP] for all the tests).

Task 2 – Leaching tests to determine the effect of pH on metal leached.

Task 3 – Leaching tests to provide insight into the effect of aerobic and anoxic conditions on the metal leached.

Core samples were collected in August 2008 from four locations, three from just outside of the CIA and one from the Osborn Flats area. The primary metals of concern were zinc, cadmium, and lead. In addition, calcium, iron, magnesium, manganese, sulfur, and selenium were also measured. The sediment samples were subjected to a sequential extraction protocol that segregates the metals into four operationally defined fractions: ion-exchangable fraction (Phase 1), acid-soluble fraction (Phase 2), organic/oxide/sulfide-bound fraction (Phase 3), and the residual fraction (Phase 4).

Metal concentrations were highest in the sediments collected at SF-BH-EPZ-12 near the CIA. The metal concentrations in locations SF-OB-PZ-13 (Osborn Flats area), BH-E-PZ-16 and BH-E-PZ-24 (both from around the CIA) for cadmium, lead, and zinc were relatively similar.

Leaching tests were conducted to determine how pH and the presence or absence of oxygen affected the concentration of leached metals. The pH of the leach solution naturally had a significant effect on the leachability of all the metals. Cadmium and zinc leached at greater rates as the pH of the leach solution was reduced. At a pH of 2, the concentration of cadmium and zinc was roughly 10 times higher in the leach solution than what was observed at pH 6 or 7. A similar pattern was observed with lead, although the differences were less dramatic, being about five times higher lead concentration at pH 2 than 6–7.

Leaching tests also were conducted to determine how the presence or absence of oxygen affected metal concentrations in leach solutions. The tests were conducted following a two-week wetting/drying cycle conducted at atmospheric conditions. The most notable observation was that each location reacted very differently from the other locations. However, at each location, cadmium and zinc reacted in the same manner.

Cadmium tended to be the most mobile metal, although it was present in the lowest concentrations. Iron was the least mobile, suggesting that most of the iron existed as stable iron oxides or mineral iron. Lead was generally more easily extracted than zinc and both were present in concentrations higher than what was observed for cadmium.

In experiments conducted at pH 7, many of the elements (aluminum, cadmium, copper, iron, magnesium, lead, and zinc) showed little or no change with time. The rates of leaching in pH 2 solutions, in contrast to the pH 7 solutions, appeared to increase with time for most of the elements. Leached concentrations were also greater at low pH, except for selenium. Leached calcium, magnesium, and potassium concentrations increased over time but appeared to approach a steady state near the end of the experiment.

A final draft report of the results was in progress at the end of FY09 for submittal in early FY10.

UMATILLA ARMY DEPOT SITE – Region 10

The Umatilla Army Depot (Lagoons) site, which occupies about 20,000 acres in Hermiston, Oregon, has operated as a storage depot for conventional munitions and chemical warfare agents since 1941. Areas of the site were contaminated with explosives and metals because of past demilitarization and disposal operations. Between the 1950s and 1965, about 85 million gallons of wastewater from explosive washout operations were discharged into two unlined lagoons. The lagoons cover about half an acre. The groundwater contaminant plume is estimated to cover 350 acres, and access to the site is restricted. About 100 people live on the post, and approximately 900 people live within three miles of the site. The nearest drinking water well is located about 6,500 feet from the disposal area. Commercial agriculture is conducted within the vicinity of the depot and crops are irrigated with area groundwater.

Review comments on the sampling plan proposed in the U.S. Army's Permit Modification Request (PMR) for the Umatilla Army Depot were delivered to the Region on May 8, 2009.

The Army is proposing the use of a new approach to liquefy mustard gas heels. More conservative DQOs are desirable to ensure that the proposed approach works effectively in characterizing metal contents and mustard agents, which, in turn, will be used to determine appropriate feed rate to control hazardous emissions into the environment. Therefore, it was recommended to sample a sufficient number of containers to ensure that a higher percentage (e.g., 99%) of containers will meet the acceptance criteria (0 exceedances) with a confidence level of 0.95. These more conservative DQOs will require sampling of 299 containers.

LOWER DUWAMISH WATERWAY SITE – Region 10

The Lower Duwamish Waterway site is a 5.5-mile stretch of the Lower Duwamish River that flows into Elliott Bay. The waterway lies south of downtown Seattle and is flanked by industrial corridors and the South Park and Georgetown neighborhoods.

Sediments (mud and sand on the river bottom) in and along the waterway contain a wide range of contaminants from years of industrial activity and from stormwater. The Washington State Department of Ecology and EPA are working to clean up contaminated sediment and control sources of recontamination.

EPA added about five miles of the waterway to its list of Superfund cleanup sites in 2001. The contaminants in the waterway sediments include PCBs, PAHs, mercury and other metals, and phthalates.

Reviewed and provided information to the EPA Regional Representative on the use of kriging standard deviation methodology for conducting sampling at the Jackson Park site area.

SEDIMENT BACKGROUND STATISTICAL WORKSHOP – Region 10

At the request of Region 10, Anita Singh from Lockheed attended the Sediment Background Workshop in Seattle on October 7, 2008. Federal, State, university, and private representatives attended the workshop with the goal of developing a Sediment Evaluation Framework (SEF) for use in Oregon, Washington, and Idaho. The SEF includes procedures for conducting a bioaccumulation assessment of dredged material, including tissue and sediment concentrations protective of aquatic life; and human and wildlife consumption of fish and shellfish.

The majority of the background-related issues dealing with univariate data sets (with and without ND observations) can be handled by ProUCL 4.0. For multivariate data sets (analyzing several correlated contaminants simultaneously), Scout software has tools to establish BTVs in the multivariate setting and to perform site versus background comparisons. The upgraded ProUCL 4.0, completed in March 2009, includes new prediction and tolerance limit features based on gamma distribution that can be used in background contaminant evaluations.

TSP FORUM MEETING MIS DISCUSSION

The first report on MIS analysis for the Nanesmond site was delivered to the SCMTSC Director on January 20, 2009. The results of the MIS analysis were presented by Anita Singh from Lockheed at the Technical Support Program (TSP) meeting in San Diego, California, on January 27, 2009. Ms. Singh also participated in a panel discussion on the MIS approach for contaminated soils.

SPENT SAND/FOUNDRY OPERATIONS

Analyses were conducted of Spent Foundry Sands data obtained from the Office of Solid Waste and Emergency Response (OSWER). The data for the analysis were divided into the following six groups:

- Inorganics group
- PAH Totals group
- Phenolics Totals group
- Toxicity Characteristic Leaching Procedure (TCLP) group
- Synthetic Precipitation Leaching Precipitation (SPLP) group
- American Society for Testing & Materials (ASTM) group

Each group contained several different sets of data. The summary of the statistical analysis was divided into two parts: the inorganics group and the leachate data. Box plots were developed to evaluate the adequacy of the detection limits for each compound/element. The data were analyzed and information for a bounding/high-end risk characterization was provided to OSWER.

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